REMARKS

Claim 19 has been amended by incorporating subject matter from claim 22 and example 1 into it, as well as to require preservation of the dielectric layer's density. (See also, page 4, lines 1-2).

Accordingly, claim 22 has been canceled.

Claims 1-21 and 23-33 are currently pending, although claims 1-18 and 31-33 have been withdrawn from consideration.

The Office Action also rejected claims 19-22, 24-27 and 29 under 35 U.S.C. §103 as obvious over U.S. patent 5,569,362 ("Lerbet") in view of U.S. patent 4,851,095 ("Scobey") and U.S. patent 4,851,095 ("Nakanishi") or U.S. patent 6,596,399 ("Verrasamy"), and claims 23, 28 and 30 under 35 U.S.C. §103 as obvious over Lerbet, Scobey, (Nakanishi or Verrasamy) and U.S. patent 4, 691,077 ("Gregory")(claim 23), U.S. patent 6,190,511 ("Wei")(claim 28) and U.S. patent 6,809,066 ("Reade")(claim 30). The Office Action recognized that Lerbet does not teach or suggest an ion beam created by a linear ion source or modifying the angle between the ion beam and the substrate and/or modifying the voltage applied to the ionic source. (Office Action at page 3). In an attempt to compensate for this fatal deficiency, however, the Office Action asserted that one of ordinary skill in the art would have been motivated to use Scobey's linear ion source in Lerbet's methods because the linear ion source would allow upward scaling capability, and that modifying the angle between the ion beam and the substrate and/or modifying the voltage applied to the ionic source would have been obvious in view of Nakanishi and Verrasamy, respectively. (Office Action at page 4). In view of the following comments, Applicants respectfully request reconsideration and withdrawal of these rejections.

The claimed invention relates to processes for depositing one or more layers on a substrate in a sputtering chamber comprising a sputtering system comprising a target, a linear ion source and a conveying system, comprising conveying the substrate through the sputtering chamber, depositing at least one dielectric thin-film layer on the substrate by sputtering with the sputtering system comprising the target, generating at least one ion beam coming from the ion source in the sputtering chamber in the presence of the sputtering system comprising the target, and adjusting the refractive index of said dielectric layer by modifying the angle between the ion beam and the surface of the substrate and/or modifying the voltage applied to the ionic source, wherein the density of the dielectric layer deposited on the substrate is preserved.

Thus, the claimed processes allow for modifying/managing the refractive index of a final product, while maintaining or preserving other properties of the product such as density. Significantly, these processes require generating the ion beam in the presence of the same sputtering system comprising the same target. In other words, the claimed processes are run such that they do not have to be stopped to open the chamber to change the target. Nothing in the applied art teaches or suggests these economical processes.

By way of background, the invention processes generally relate to the industrial production of glass substrates covered with a stack of thin layers by magnetron technology. Typically, the layers are deposited on glass sheets of approximately 6m x 3m, and the magnetron is dimensioned to make it possible to deposit the layers over the entire width of the glass sheet. The targets used therefore have lengths of about 3m.

The stack of layers typically possesses desired optical characteristics (for example, luminous transmission, luminous reflection, color in reflection on each side of the substrate, color in transmission, etc.). Thus, when exiting the magnetron line, the stack of layers

theoretically possesses the desired optical properties. One of ordinary skill in the art would know that the main parameter enabling him to optically define the stack of layers is the index of the layers deposited under deposition conditions. So, hypothetically speaking, if a manufacturer desired many optical nuances of covered substrates (for example, color variations on the covered substrate), one of ordinary skill in the art would modify the index of the layers deposited to be able to moderate the optical characteristics as simply as possible and as quickly as possible, particularly given that the magnetron typically functions uninterrupted 24 hours a day.

The present invention provides methods by which it is possible to vary, quickly and simply, the index of a layer deposited by a continuously running magnetron. Thus, the present invention makes it possible to vary the index of a deposited layer, thereby making it possible to modify the optical characteristics of the substrates at the exit of magnetron without having to change the target and/or to disrupt then reinstitute vacuum conditions. Furthermore, the present invention is able to vary the index of the layer without significant detriment to the mechanical or chemical characteristics of the stack (for example, density).

According to the present invention, a layer is deposited by magnetron and ionic source and the production/modification of the layer is regulated so as to produce a product having optical characteristics, and the ionic source is used to modify the index of the deposited layer, thereby enabling modification of the optical characteristics without significant detriment to the mechanical or chemical characteristics of the stack. In a sense, the present invention relates to the discovery that it is possible to produce stacks having different optical properties by modifying the index of the deposited layer.

For example, as illustrated in Figure 2 of the present application, modifying the voltage applied to the ionic source can preserve the index of the at the value obtained without

ion beam when the voltage applied is ≤ 500 V and increasing this voltage can adjust and decrease the index. Also, as illustrated in Figure 3, for an angle between the ion beam and the surface of the substrate, the index of the layer can be adjusted (increased/decreased) by modification of the voltage applied to the ionic source. Also, Figure 3 demonstrates that this possible adjustment of the index is not the same if the angle between the ion beam and the surface of the substrate is not the same. Thus, the claimed methods requiring modification of the angle between the ion beam and the surface of the substrate and/or modification of the voltage applied to the ionic source yield unique products having unique properties. The applied art neither teaches nor suggests this invention.

More specifically, none of the applied art teaches, suggests, recognizes any benefits associated with, or would lead one of ordinary skill in the art to practice the claimed methods including modification of the angle between the ion beam and the surface of the substrate and/or modification of the voltage applied to the ionic source in the same sputtering chamber in the presence of the same sputtering system having the same target which allow the variation of the index of the layer without significant detriment to the mechanical or chemical characteristics of the stack (for example, density).

Lerbet discloses a process which increases the chemical and/or physical durability of a layer on a product in an R&D environment by thickening the layer (that is, by modifying the chemical and/or mechanical properties of the layer). Thus, unlike the invention methods, Lerbet's methods modify the chemical and/or mechanical properties, resulting in an inferior layer. Moreover, one of ordinary skill in the art seeking an appropriate industrial process would not be led to such a process by Lerbet's limited, unhelpful disclosure related to interrupted, non-continuous R&D techniques.

Furthermore, Lerbet does not teach, suggest or recognize that the ionic source parameters can be modified in such a way as to adjust the index of the dielectric layer, particularly given that such a modification would take place without stopping production in the presence of the same sputtering system comprising the same target, or at the very least without opening the magnetron.

At any rate, as recognized by the Office Action, Lerbet does not teach or suggest an ion beam created by a linear ion source.

Scobey cannot compensate for Lerbet's fatal deficiencies. Scobey relates to a low energy process ("Typical operation is at 2 to 4 amps and 100 to 120 volts" -- col. 9, lines 17-18) which does not teach, suggest or recognize any benefits with modifying the angle between the ion beam and the surface of the substrate and/or modifying the voltage applied to the ionic source. That is, Scobey does not recognize that the angle between ion beam and surface substrate or applied voltage applied are result effective variables, particularly with respect to achieving variation of the index of the layer without detriment to the mechanical or chemical characteristics of the stack, so no motivation would have existed to optimize these variables to yield the claimed processes.

Nakanishi and Verrasamy are similarly deficient. It is only through hindsight, using the present application as a guide, that one skilled in the art would be led to practice the claimed processes employing the required modifying the angle between the ion beam and the surface of the substrate and/or modifying the voltage applied to the ionic source in the presence of the same sputtering system comprising the same target. Under such circumstances, the claimed methods cannot be obvious.

The tertiary references applied in the Office Action, Gregory, Wei and Reade, are cited merely for disclosure related to particular aspects of dependent claims and cannot compensate for Lerbet's and Scobey's deficiencies.

In view of all of the above, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. §103.

Applicants believe that the present application is in condition for allowance. Prompt and favorable consideration is earnestly solicited.

Respectfully submitted,

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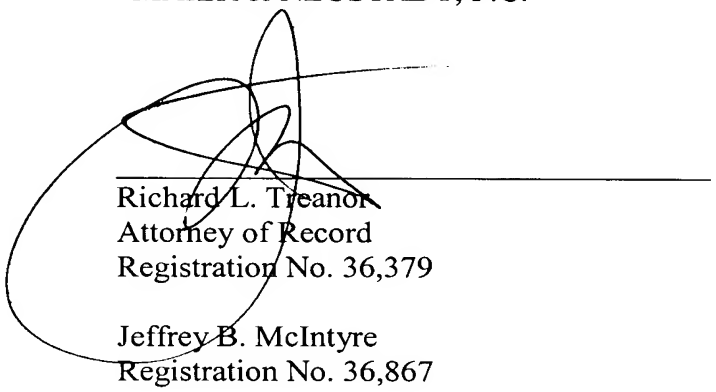

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